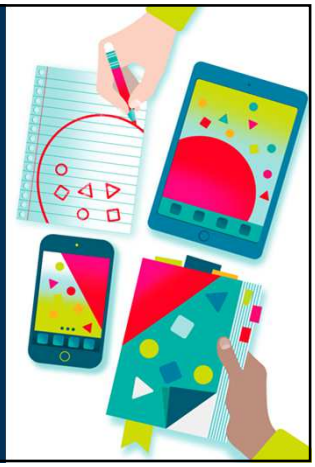
Pearson

Statistics Survival Guide for OTs

Melinda Cooper
Occupational Therapy Consultant
Pearson Clinical Assessment

melinda.cooper@pearson.com

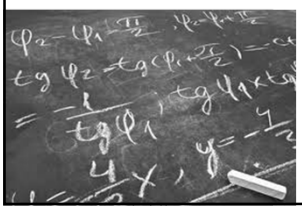


Are you

perplexed by percentiles?

confounded by confidence intervals?

stumped by standard scores?



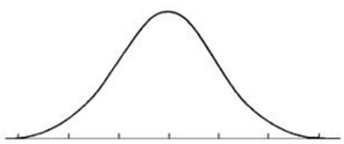
Let's start with a poll...

You are not alone!

Basic Terminology

Normal distribution

- Many common human attributes are normally distributed
- The highest concentration of scores is in the centre



Basic Terminology

Standardised Scores

- Allow us to plot where performance falls on the curve
  - Standard scores
  - Scaled scores
  - T scores
  - Percentile ranks

Basic Terminology

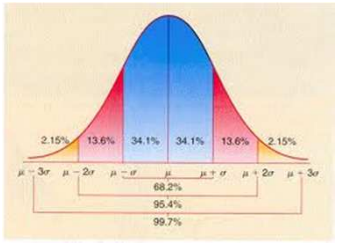
Mean

- The 'average' of scores in the sample
- In normal distributions, occurs at the mid point of the data

Standard deviation

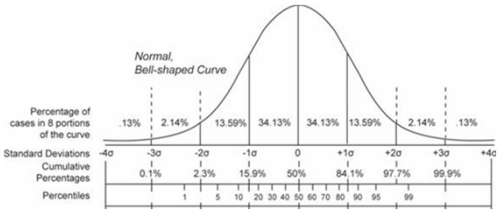
- The amount of variance in the data
- Related to the size of the sample

Basic Terminology



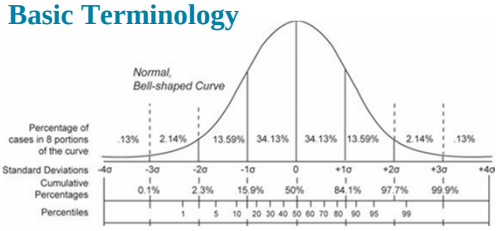
- We describe standardised assessment results in terms of how many standard deviations they are from the mean

Basic Terminology



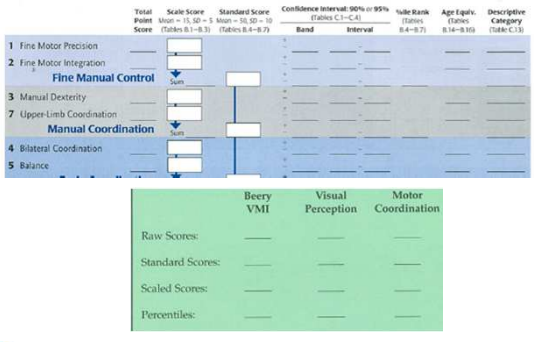
- **Standard scores** often have a mean of 100 and a standard deviation of 15
- **Scaled scores** often have a mean of 10 and a standard deviation of 3

Basic Terminology



- **Percentiles** describe performance as a rank relative to the sample, e.g. a score at the 30th percentile is higher than 30% of the sample group's scores
- Percentile ranks between 16 and 84 are considered average

Using standardised scores in practice



Using standardised scores in practice

RBMT 3 Rivermead Behavioural Memory Test – Third Edition (RBMT-3)

Record Form

Name: Examiner:
Date of Birth: Date of Assessment:
Gender: Male Female Version: 1 (First assessment) 2 (Retest)

Summary of Scores

Subtest	Raw Score	Scaled Score (SS)
First and Second Names – Delayed Recall (N)		
Belongings – Delayed Recall (B)		
Appointments – Delayed Recall (A)		
Picture Recognition – Delayed Recognition (PR)		
Story – Immediate Recall (SI)		
Story – Delayed Recall (SD)		
Face Recognition – Delayed Recognition (FR)		
Route – Immediate Recall (RI)		

Index Score	
Sum of Scaled Scores	
General Memory Index	
Percentile Rank	
Confidence Interval	
95%	90%

Using standardised scores in practice

Performance Raw Score Totals

Visual Motor (VM)	Total	Fine Motor (FM)	Total	Gross Motor (GM)	Total
Follow the Path	/8	Clay Play	/24	Statue	/12
Flying Birds	/13	Penny Bank Game	/30	Throw and Catch	/11
Clouds Game	/5	Origami	/26	Soccer	/43
Hidden Forks	/9	Snack Time	/21	Jumping	/36
Find the Rabbits	/9	FM Behavior Rating	/9	GM Behavior Rating	/9
Copying Shapes	/18				
Writing	/12				
VM Behavior Rating	/9				
VM Raw Score	/83	FM Raw Score	/110	GM Raw Score	/111

Norm-Referenced Performance Scores

	Visual Motor	Fine Motor	Gross Motor
Scaled Score			
Scaled Score Points +/-			
Confidence Interval % Level		to	to
Percentile Rank			
Percentile Rank Confidence Interval		to	to
Age Equivalent			

BADS profile score	Standardised score (mean 100, SD 15)	40 or less	41 to 65	65 to 87	Overall classification
0	12	0	8	19	
1	17	6	13	24	
2	22	11	18	29	
3	27	16	23	34	
4	32	22	28	39	
5	37	27	33	44	
6	41	33	38	49	Impaired
7	46	38	43	54	
8	51	43	48	59	
9	56	49	53	64	
10	61	54	58	69	
11	67	59	63	74	Borderline
12	70	65	68	79	
13	75	70	73	84	Low average
14	80	75	78	89	
15	85	81	83	94	
16	90	86	88	99	Average
17	95	91	93	104	

Pearson

13

More terminology

Standard error

- Samples are not the same as real life!
- Calculated using formula $StErr = \frac{s}{\sqrt{n}}$
- Therefore, the lower the standard deviation and the bigger the sample, the lower the StErr

Confidence intervals

- Help us to allow for standard error
- A more precise way to report scores
- Calculated by adding and subtracting CI from score

Pearson

14

Calculating Confidence Intervals

Ages 6:0–6:11

Scaled Score	VM	FM	GM
19	—	—	162–160
18	95	122	161
17	94	121	160
16	—	120	158–159
15	92	118–119	155–157
14	91–92	116–117	151–154
13	89–90	114–115	147–150
12	87–88	111–113	142–146
11	85–86	108–110	136–141
10	82–84	104–107	130–135
9	78–81	99–103	123–129
8	74–77	93–98	116–122
7	71–73	88–92	109–115
6	68–70	84–87	102–108
5	64–67	79–83	94–101
4	60–63	73–78	86–93
3	55–59	66–72	77–85
2	50–54	59–65	68–76
1	0–49	0–58	0–67

Scaled Score Points for Building Confidence Intervals

Confidence Level	VM	FM	GM
68%	1	1	1
90%	2	2	1
95%	3	3	2

Age	Confidence Level (%)	Brief Form (knee push-ups)	Brief Form (full push-ups)
4	95	8	8
	90	6	6
5	95	9	10
	90	8	8
6	95	9	10
	90	8	8
7	95	9	9
	90	7	7

Sum of Scaled Scores	GMI	Percentile Rank	Confidence Interval 90%	Confidence Interval 95%
17	56	0.2	47–64	45–66
18	56	0.2	47–64	45–66
19	56	0.2	47–64	45–66
20	56	0.2	47–64	45–66
21	56	0.2	47–64	45–66
22	56	0.2	47–64	45–66
23	56	0.2	47–64	45–66
24	56	0.2	47–64	45–66
25	56	0.2	47–64	45–66
26	56	0.2	47–65	45–66
27	56	0.2	47–65	45–66
28	56	0.2	47–65	45–66
29	56	0.2	47–65	45–66
30	56	0.2	47–65	45–66
31	56	0.2	47–65	45–66
32	56	0.2	47–65	45–66

Pearson

15

Case example

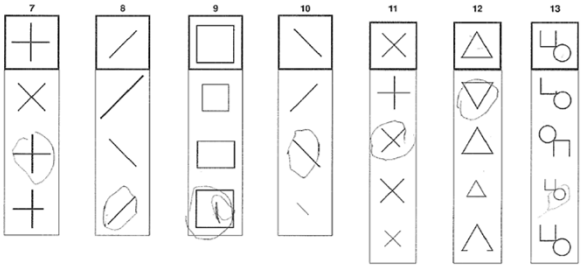
- Aidan is 7 years, 2 months
- On the BOT-2 fine motor precision subtest he achieved a scale score of 9
- After a period of intervention you reassess him
- This time he scores 11
- Has he really improved?
- Confidence interval for first score is 6-12

Pearson

16

Case example

4 years, 5 months – VMI standard score 96, VP 80



Pearson

17

A quick word on age equivalents...

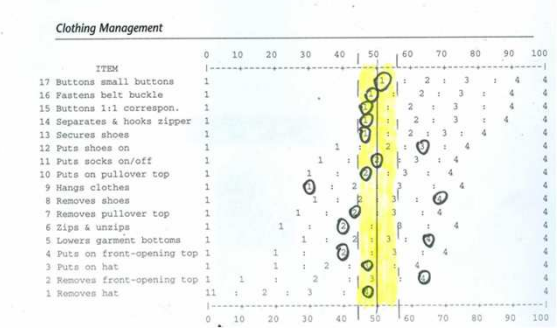
- Beware the age equivalent!
- Age equivalents represent, in years and months, the average age of children in the sample who obtained a particular raw score
- **They do not indicate the developmental age at which the child is functioning**
- Therefore they are best avoided
- It's far more advisable to use standard scores or percentile ranks

Pearson

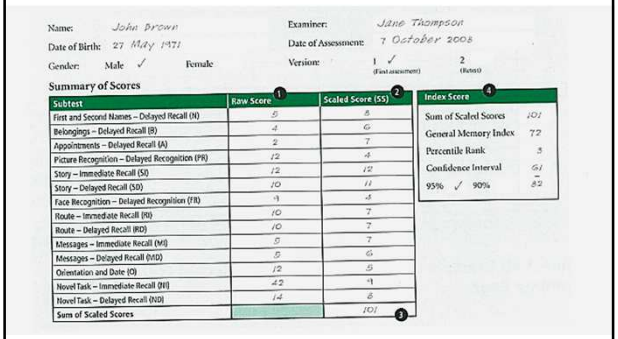
18

Statistics in action

- So, now we know what the numbers represent, let's take a look at a few clinical examples…



School Function Assessment Criterion Score = 50
Standard error = 3
95% confidence interval = 44-56



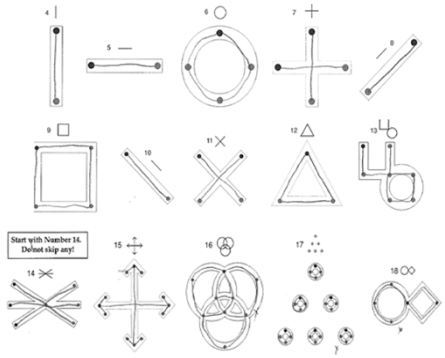
Name: John Brown
Date of Birth: 27 May 1971
Gender: Male ✓ Female
Examiner: Jane Thompson
Date of Assessment: 7 October 2008
Version: 1 ✓ (First assessment) 2 (Retest)

Summary of Scores

Subtest	Raw Score	Scaled Score (SS)
First and Second Names – Delayed Recall (N)	5	8
Belongings – Delayed Recall (B)	4	6
Appointments – Delayed Recall (A)	2	7
Picture Recognition – Delayed Recognition (PR)	12	4
Story – Immediate Recall (SI)	12	12
Story – Delayed Recall (SD)	10	11
Face Recognition – Delayed Recognition (FR)	9	8
Route – Immediate Recall (RI)	10	7
Route – Delayed Recall (RD)	10	7
Messages – Immediate Recall (MI)	5	7
Messages – Delayed Recall (MD)	5	6
Orientation and Date (O)	12	5
Novel Task – Immediate Recall (NI)	12	9
Novel Task – Delayed Recall (ND)	14	8
Sum of Scaled Scores		101

Index Score	
Sum of Scaled Scores	101
General Memory Index	72
Percentile Rank	3
Confidence Interval	61 – 82
95% ✓ 90%	

7 years, 0 months – VMI score 102, VP 114, MC 92



Reporting standardised scores

- Remember that our clients are not statisticians!
- Think about the goal of your report e.g. funding
- Our job as therapists is to interpret scores
- If our assessment is the raw ingredients, then our report should be the cake!

So….

How do you feel about statistics now?


There’s so much
more to learn
Find out more about us at
www.pearsonclinical.com.au